ETHERNET SWITCH MODULE

(3E02-04/3E05-04/3E07-04/3E08-04 AND 3E02-08-ATX) USER GUIDE

CABLETRON SYSTEMS

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CONTENTS

CHAPTER 1 INTRODUCTION

1.1 Document Conventions 1-2
1.2 Related Manuals 1-3
1.3 Getting Help 1-3
1.4 General Description 1-4
1.5 3E02-04 Ethernet Switch Module 1-5
1.5.1 Connectors 1-6
1.5.2 LEDs 1-6
1.5.3 Offline Button 1-6
1.6 3E07-04 Ethernet Switch Module 1-6
1.6.1 Connectors 1-7
1.6.2 LEDs 1-7
1.6.3 Offline Button 1-7
1.7 3E08-04 Ethernet Switch Module 1-7
1.7.1 Connectors 1-8
1.7.2 LEDs 1-8
1.7.3 Offline Button 1-8
1.8 3E05-04 Ethernet Switch Module 1-8
1.8.1 Connectors 1-8
1.8.2 LEDs 1-9
1.8.3 Offline Button 1-9
1.9 3E02-08-ATX Ethernet Switch Module 1-9
1.9.1 Connectors 1-9
1.9.2 LEDs 1-10
1.9.3 Offline Button 1-10

CHAPTER 2 CONNECTING TO THE NETWORK

2.1 Introduction 2-1
2.2 Power-up LED Sequence 2-1
2.3 Connecting to a Network 2-2
2.3.1 Connecting the 3E02-04 Ethernet Switch Module 2-3
2.3.2 Connecting the 3E07-04 Ethernet Switch Module 2-3
2.3.3 Connecting the 3E08-04 Ethernet Switch Module 2-4
2.3.4 Connecting the 3E05-04 Ethernet Switch Module 2-5
2.3.5 Connecting the 3E02-08-ATX Ethernet Switch Module .. 2-6

CHAPTER 3 CONFIGURING

3.1 Introduction 3-1
3.2 Connecting the Local Console Manager 3-2
3.3 LCM Commands 3-2

CHAPTER 4 MONITORING

4.1 Displaying Port Status 4-1
4.1.1 Status Command 4-1

CHAPTER 5 DIAGNOSTICS AND TROUBLESHOOTING

5.1 Power-up Diagnostics 5-1
5.1.1 Power-up Tests 5-1
5.1.2 Power-Up Results 5-1
5.2 Operational Diagnostics 5-3
5.2.1 Diagnostic Results 5-4
5.3 Troubleshooting 5-4
5.3.1 If The Module Fails To Power Up 5-4
5.3.2 Connectivity Problems 5-5

CHAPTER 6 ADDING/SWAPPING MODULES

6.1 Unpacking The Ethernet Switch Module 6-1
6.2 Adding An Ethernet Switch Module 6-1
6.3 Swapping An Ethernet Switch Module 6-2

APPENDIX A TECHNICAL SPECIFICATIONS

APPENDIX B CABLES

B.1 Types/Connectors B-1
B.2 Cable Specifications B-1
B.3 10BASE-T Pin Assignments B-3
B.3.1 Crossover Wiring B-4
B.3.2 Straight-Through Wiring B-5
B.4 AUI Pin Assignments B-5
B.5 5 - 4 - 3 Rule B-6
B.5.1 Definitions B-7

INDEX

CHAPTER 1
INTRODUCTION

This manual is for system administrators responsible for configuring, monitoring and maintaining the ATX. It should be used with the *ATX User Guide* and the *ATX MIB Reference Guide*. The contents of each chapter are described below.

- Chapter 1, **Introduction**, provides a general description of the modules.
- Chapter 2, **Connecting to the Network**, describes how to physically attach a module to an Ethernet network.
- Chapter 3, **Configuring**, discusses the software configuration options for the modules.
- Chapter 4, **Monitoring**, provides information on Ethernet port statistics obtained via LCM.
- Chapter 5, **Diagnostics and Troubleshooting**, discusses identifying possible problems with the modules.
- Chapter 6, **Adding/Swapping Modules**, gives instructions for adding and replacing an Ethernet module.
- Appendix A, **Technical Specifications**, lists the pertinent technical information about the modules.
- Appendix B, **Cables**, lists pertinent cabling information about the modules.

1.1 DOCUMENT CONVENTIONS

The following conventions are used in presenting information in this manual:

Commands, prompts, and information displayed by the computer appear in Courier typeface:

```
Current Number of Station Addresses: 5
Current Number of Learned Addresses: 133
Number of Defined Filters: 4
```

Information that you enter appears in Courier bold typeface:

```
ATX >status
```

Information that you need to enter with a command is enclosed in angle brackets <>. For example, you must enter a MAC address to execute the `address matrix` <MAC address> command:

```
ATX >address matrix 00:40:27:04:1a:0f
```

Field value options appear in bold typeface. For example, a filter type can be either **Entry** or **Exit**.

Note symbol. Calls the reader's attention to any item of information that may be of special importance.

Tip symbol. Conveys helpful hints concerning procedures or actions.

Caution symbol. Contains information essential to avoid damage to the equipment.

Warning symbol. Warns against an action that could result in equipment damage, personal injury or death.

1.2 RELATED MANUALS

You may need to refer to the following documentation when you are using the Ethernet module:

- *ATX User Guide* – contains installation and configuration instructions for the ATX.
- *ATX MIB Reference Guide* – describes the use of Cabletron's enterprise MIB.

If you need internetworking reference material, you may find the following books helpful:

- *Interconnections, Bridges and Routers,* Radia Perlman, Addison Wesley © 1992.
- *Internetworking with TCP/IP: Protocols, and Architecture* (2nd edition), Volumes I and II, Douglas Comer, Prentice Hall © 1991.
- *The Simple Book, An Introduction to Management of TCP/IP-based Internets,* Marshall T. Rose, Prentice Hall © 1991.

1.3 GETTING HELP

If you need additional support related to this device, or if you have any questions, comments, or suggestions concerning this manual, contact Cabletron Systems Technical Support:

By phone		(603) 332-9400
		Monday – Friday; 8 A.M. – 8 P.M. Eastern Time
By CompuServe		GO CTRON from any ! prompt
By Internet mail		support@ctron.com
By FTP		ctron.com (134.141.197.25)
	Login	*anonymous*
	Password	*your email address*

1.4 GENERAL DESCRIPTION

Cabletron Systems Ethernet Switch Modules connect the ATX to a maximum of four individual Ethernet IEEE 802.3 LANs. The Ethernet Switch Module (3E02-08-ATX) connects to a maximum of eight Ethernet IEEE 802.3 LANs.

Both module types enable connectivity to FDDI, Token Ring, and Ethernet networks, and can be configured to support Transparent Spanning Tree, Source Routing, or Source Routing Transparent Bridging on each of the ports. The ATX can translate higher level protocols to allow communication between end-nodes on Ethernet as well as FDDI or Token Ring. Protocols translated include TCP/IP, Novell NetWare, and AppleTalk Phase II.

The four port Ethernet Switch Module is available in four versions to support various cabling types:

- 3E02-04: provides four Unshielded Twisted Pair (UTP) connections
- 3E07-04: provides four thin coaxial cable connections
- 3E08-04: provides four multimode fiber optic connections
- 3E05-04: provides four Attachment Unit Interface (AUI) connections

The 3E02-08-ATX module provides eight UTP connections.

The Ethernet Switch Modules include processing circuitry for receiving and forwarding data packets between the connected devices. Each module contains an offline button and several LEDs that indicate the module's and individual ports' operational status.

The four port modules may be installed in any of the five interface slots and the ATX can simultaneously support up to five Ethernet Switch Modules.

The 3E02-08-ATX module may be installed in any of the five interface slots in a ATX, and the ATX can simultaneously support up to five eight port modules. Each module provides connectivity to the multiple LANs.

Each module provides connectivity to the multiple LANs. Since packets are bridged/routed across Ethernet Switch Modules only when it is necessary to reach the end device, each four port module can support four distinct 10 Mbps LANs, while the eight port module supports eight distinct 10 Mbps LANs.

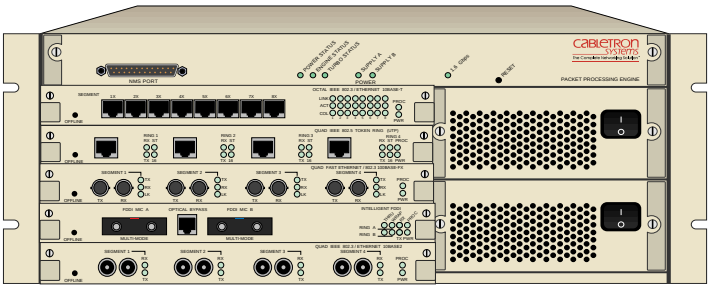


Figure 1-1 ATX Front Panel

1.5 3E02-04 ETHERNET SWITCH MODULE

The 3E02-04 (Figure 1-2) provides connection for four independent 10BASE-T LANs to the ATX backplane and packet processing module. It includes processing circuitry for receiving and forwarding packets between the connected 10BASE-T LANs. The module provides several LEDs to indicate the module's operational status.

The module supports twisted pair Ethernet and the IEEE 802.3 10BASE-T specification.

1.5.1 Connectors

The 3E02-04 includes eight 8-pin RJ45 ports for attachment directly to the network through UTP cabling. The ATX power supply provides the power for the module.

An internal receive/transmit pair crossover is provided in the second connector (far right, marked with an X) on each port. This means that when either a station or server is directly attached to a 3E02-04 port, you can choose to use either straight-through or crossover cabling. For more cabling and crossover information, see Appendix B.

1.5.2 LEDs

The 3E02-04 provides a total of 18 green LEDs labeled LNK, COL, RX and TX for each segment, plus PROC and PWR for the module. The LEDs are described in Chapter 5, **Diagnostics and Troubleshooting**, of this manual.

1.5.3 Offline Button

Use the offline button before swapping the module, to take it offline until the replacement is installed.

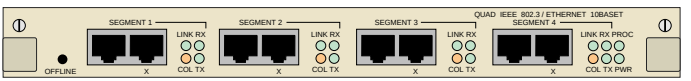


Figure 1-2 3E02-04 Module Front Panel

1.6 3E07-04 ETHERNET SWITCH MODULE

The 3E07-04 (Figure 1-3) provides connection for four independent 10BASE2 LANs to the ATX backplane and packet processing module. It includes processing circuitry for receiving and forwarding packets between the connected 10BASE2 LANs. The 3E07-04 contains several LEDs to indicate the module's operational status.

The 3E07-04 supports thin coaxial cable Ethernet and the IEEE 802.3 10BASE2 specification.

1.6.1 Connectors

The 3E07-04 includes four pairs of BNC barrel connectors for thin coaxial cabling. Each of the four segments provides an internal BNC T-connector, therefore an external T-connector is not required. The ATX power supply provides the power for the module.

1.6.2 LEDs

The 3E07-04 contains a total of 10 green LEDs labeled RX and TX for each segment, plus PROC and PWR for the module. The LEDs are described in Chapter 5 of this manual.

1.6.3 Offline Button

Use the offline button before swapping the module, to take it offline until the replacement is installed.

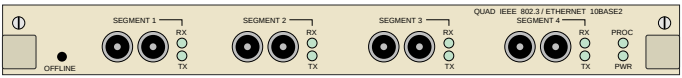


Figure 1-3 3E07-04 Front Panel

1.7 3E08-04 ETHERNET SWITCH MODULE

The 3E08-04 (Figure 1-4) provides connection for four independent multimode 10BASE-FL LANs to the ATX backplane and packet processing module. It includes processing circuitry for receiving and forwarding packets between the connected 10BASE-FL LANs. The 3E08-04 contains several LEDs to indicate the module's operational status.

The 3E08-04 supports Ethernet and the IEEE 802.3 10BASE-FL specification.

1.7.1 Connectors

The 3E08-04 includes four pairs of fiber optic ST connectors for fiber optic cabling. Receive (RX) and transmit (TX) connectors are clearly marked on the front panel of the module. The ATX power supply provides the power for the module.

1.7.2 LEDs

The 3E08-04 contains a total of 18 green LEDs labeled LNK, COL, RX and TX for each segment, plus PROC and PWR for the module. The LEDs are described in Chapter 5 of this manual.

1.7.3 Offline Button

Use the offline button before swapping the module, to take it offline until the replacement is installed.

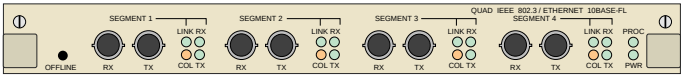


Figure 1-4 3E08-04 Front Panel

1.8 3E05-04 ETHERNET SWITCH MODULE

The 3E05-04 (Figure 1-5) provides connection for four independent Ethernet IEEE 802.3 LANs to the ATX backplane and packet processing module. It includes processing circuitry for receiving and forwarding packets between the connected LANs. The 3E05-04 contains several LEDs to indicate the module's operational status.

The 3E05-04 supports Ethernet version 2 and the IEEE 802.3 specification.

1.8.1 Connectors

The 3E05-04 includes four DB15 AUI connectors which you can connect to an AUI drop cable or to a transceiver attached to a LAN.

1.8.2 LEDs

The 3E05-04 contains a total of 10 green LEDs labeled RX and TX for each segment, plus PROC and PWR for the module. The LEDs are described in Chapter 5 of this manual.

1.8.3 Offline Button

Use the offline button before swapping the module, to take it offline until the replacement is installed.

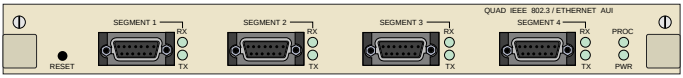


Figure 1-5 3E05-04 Front Panel

1.9 3E02-08-ATX ETHERNET SWITCH MODULE

The 3E02-08-ATX (Figure 1-6) provides connection for eight independent 10BASE-T LANs to the ATX. It includes processing circuitry for receiving and forwarding packets between the connected 10BASE-T LANs. The 3E02-08-ATX contains several LEDs to indicate the module's operational status.

The 3E02-08-ATX supports UTP cabling and the IEEE 802.3 10BASE-T specification.

1.9.1 Connectors

The 3E02-08-ATX includes eight 8-pin RJ45 receptacle connectors with built-in crossover that you can attach directly to the network using unshielded twisted pair (UTP) cabling. The ATX power supply provides the power for the module.

An internal receive/transmit pair crossover is provided within each port. This means that depending on whether crossover is provided on the device you're connecting to, you can use either crossover or straight-through UTP cable to connect a device to a port. For more cabling and crossover information, see Appendix B.

1.9.2 LEDs

The 3E02-08-ATX contains a total of 26 green LEDs labeled LINK, ACT, COL for each segment, plus PROC and PWR for the module. The LEDs are described in Chapter 5 of this manual.

1.9.3 Offline Button

Use the offline button before swapping the module, to take it offline until the replacement is installed.

Figure 1-6 3E02-08-ATX Front Panel

CHAPTER 2
CONNECTING TO THE NETWORK

2.1 INTRODUCTION

This chapter provides reference material and instructions for a network administrator configuring the Ethernet Switch Modules.

For instructions on adding a module to the ATX, see Chapter 6, **Adding/Swapping Modules**.

2.2 POWER-UP LED SEQUENCE

Power-up the ATX and observe the LED sequence. It takes about 1 minute for the ATX to complete the power-up diagnostics. The ATX begins system diagnostics on the PPE (topmost module) and then individually on each installed module progressing from top to bottom.

The specific power-up tests run on the Ethernet switch modules are:

- ROM checksum test
- Instruction memory test
- Memory map tests
- Interrupt tests
- Ethernet data loopback test

The power-up LED sequence for an Ethernet Switch Module not attached to a network is as follows:

1. All LEDs flash.
2. The PWR LED remains on, and the TX and RX LEDs flash.
3. 3E02-04:
   The PROC LED comes on for 5 seconds, then blinks, then remains lit. The RX, COL, and TX LEDs flash for 100 milliseconds.

   3E07-04:
   The PROC, RX, and TX LEDs come on for 5 seconds, then the RX and TX LEDs go off. The PROC LED remains lit.

   3E08-04:
   The PROC LED comes on for 5 seconds, then blinks, then remains lit. The RX, COL, and TX LEDs flash for 100 milliseconds.

   3E05-04:
   The PROC, RX, and TX LEDs come on for 5 seconds, then the RX and TX LEDs go off. The PROC LED remains lit.
4. After a few seconds the module reboots and the PROC LED comes on.
5. All other LED activity beyond this point is a function of the configuration and connection of the ATX.

2.3 CONNECTING TO A NETWORK

To connect an Ethernet Switch Module to an Ethernet network, use the following types of Ethernet cable:

- Unshielded twisted pair (10BASE-T)
- Thin coaxial cabling (10BASE2)
- Multimode fiber optics (10BASE-FL)
- Attachment Unit Interface cabling (10BASE5)

To connect the 3E02-08-ATX to an Ethernet network, use UTP cable (10BASE-T).

2.3.1 Connecting the 3E02-04 Ethernet Switch Module

You can connect each of the four 10BASE-T ports on the 3E02-04 to a 10BASE-T port on a device such as a workstation, server, hub, etc. using unshielded twisted pair wiring. The second RJ45 connector (far right, marked with an X) for each port on the 3E02-04 provide internal crossover. This means that you can choose which type of UTP cable (crossover or straight-through) you need to connect devices to these ports. Refer to Appendix B, **Cables** for cable specifications.

Connect one end of a UTP cable to an open 10BASE-T port on the 3E02-04 and the other end to the RJ45 port on the device (see Figure 2-1). If the device doesn't have an RJ45 port, connect a 10BASE-T transceiver directly to the device's AUI port, and then connect the UTP cable to the RJ45 port on the transceiver.

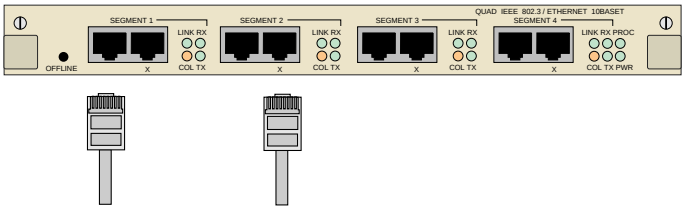


Figure 2-1 Connecting to the 3E02-04

2.3.2 Connecting the 3E07-04 Ethernet Switch Module

You can connect each of the four pairs of BNC ports on the 3E07-04 to a thin coax network or port. Each segment has two female BNC connectors which form an internal T connection, eliminating the need for an external BNC T-connector.

Attach the male end of a thin coax to the first BNC connector (see Figure 2-2). Connect either another thin coax cable section or a 50-ohm terminator to the other BNC connector on the same segment on the 3E07-04 module. Refer to Appendix B, **Cables** for cable specifications.

NOTE

You do not need to attach terminators to unattached segments.

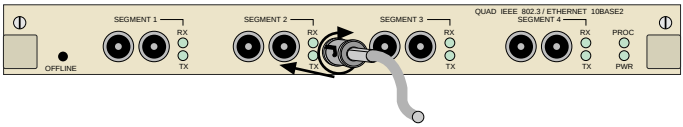


Figure 2-2 Connecting the 3E07-04

2.3.3 Connecting the 3E08-04 Ethernet Switch Module

You can connect each of the four pairs of ST fiber ports on the 3E08-04 to a 10BASE-FL port on a device such as a hub, etc. using fiber optic cable. Each fiber segment has a pair of female ST connectors clearly marked as “RX” and “TX.”

Attach the transmit (TX) connector on the 3E08-04 to the receive (RX) connector on the attached device. Similarly, the receive (RX) connector on the 3E08-04 must be connected to the transmit (TX) connector on the attached device (see Figure 2-3). Refer to Appendix B for cable specifications.

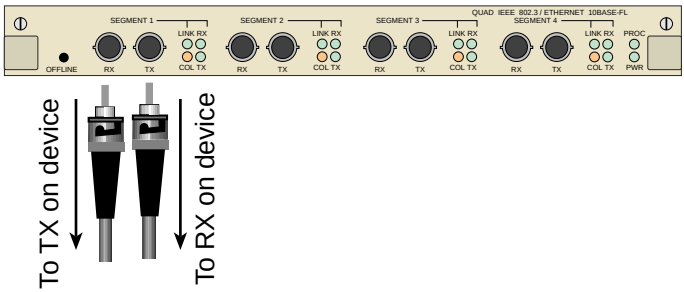


Figure 2-3 Connecting the 3E08-04

2.3.4 Connecting the 3E05-04 Ethernet Switch Module

You can connect each of the four AUI connectors on the 3E05-04 to an Ethernet network.

To connect the 3E05-04 module to a thick coax network, you must use an AUI drop cable and a tap-type transceiver:

1. Attach a tap-type transceiver to the thick coax cable. Refer to the transceiver manufacturer's manual for installation instructions.
2. Connect one end of the AUI drop to an AUI port on the 3E05-04 and the other end to the tap-type transceiver.
    a. Slide the hold-down clip on the female DB15 connector on the module to the open position.
    b. Attach the male DB15 connector on the drop cable, and then slide the clip back to the closed position.

To connect the 3E05-04 to an alternate media network, you must use a transceiver connected to the module's AUI port. There are many types of Ethernet transceivers available; the transceiver must be matched to the Ethernet cable type. Refer to Appendix B for cable specifications.

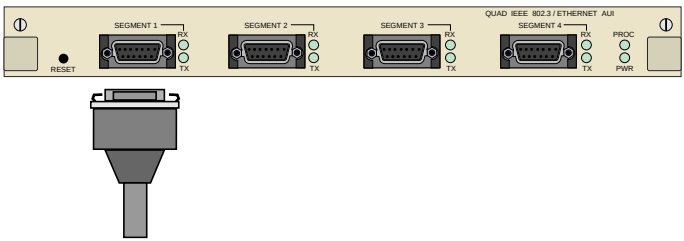


Figure 2-4 Connecting the 3E05-04

2.3.5 Connecting the 3E02-08-ATX Ethernet Switch Module

You can connect each of the eight ports on the 3E02-08-ATX to a 10BASE-T port on a device such as a workstation, server, hub, etc. using UTP wiring. The RJ45 ports on the 3E02-08-ATX provide internal crossover, which means that, depending on whether crossover is provided on the device you're connecting to, you can use either crossover or straight-through UTP cable to connect a device to a port. Refer to Appendix B for cable specifications.

Connect one end of a UTP cable to an open 10BASE-T port on the 3E02-08-ATX and the other end to the RJ45 port on the device (see Figure 2-5). If the device doesn't have an RJ45 port, connect a 10BASE-T transceiver directly to the device's AUI port, and then connect the UTP cable to the RJ45 port on the transceiver.

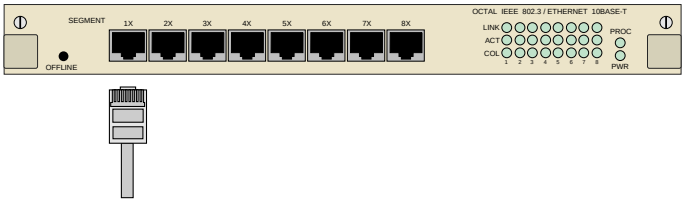


Figure 2-5 Connecting the 3E02-08-ATX

CHAPTER 3
CONFIGURING

3.1 INTRODUCTION

You can configure the Ethernet Switch Modules using the following tools:

- Local Console Manager (LCM) – allows you to monitor, manage, and configure your ATX through an out-of-band RS-232 connection
- SPECTRUM Element Manager or the full SPECTRUM Enterprise network management platform
- Any SNMP compliant network management system

For more details about LCM, see your *ATX User Guide*. For details about the other network management software, refer to the product's documentation.

The following attributes are configurable using LCM:

- Port's IP address for originating and receiving IP packets
- Enabling/disabling a port's Transparent Spanning Tree, Source Routing or Source Routing Transparent mode

Additionally, you can configure the following attributes using network management software platforms (refer to the network management software documentation for specific instructions):

- Parameters for diagnostic loopback testing of a port
- Protocol translations

Filtering normally occurs as part of the Transparent Spanning Tree and Source Routing algorithms. In addition, you can establish configurable criteria for filtering, to allow greater management control for security or network congestion reasons. All configured filtering criteria are

maintained in non-volatile memory and are saved across power cycles. Filtering information is covered in the *ATX User Guide*.

3.2 CONNECTING THE LOCAL CONSOLE MANAGER

Connect the Local Console Manager (LCM) to the ATX. Refer to Chapter 2, **Connecting to the Network**, of the *ATX User Guide* for specific instructions.

Make sure the ATX is powered on and press `<Return>` a few times. When the ATX > prompt appears, LCM is ready to use.

3.3 LCM COMMANDS

To configure an Ethernet Switch Module, refer to the *ATX User Guide* for LCM commands generic to all modules. Familiarize yourself with LCM before configuring the module. Specific instructions for displaying the port status are given in Chapter 4, **Monitoring**.

CHAPTER 4
MONITORING

4.1 DISPLAYING PORT STATUS

Using LCM, you can obtain the status of ports by typing status for the appropriate port. A sample display is shown below.

4.1.1 Status Command

```
ATX >status 2
Port 2 (1st port on module 3) status

Type: Ethernet/802.3 CSMA/CD
Bridging: Transparent/Translating
Routing: IP Routing RIP
Enabled/Disabled: Bridging/Routing functions enabled
Spanning Tree: Forwarding
Pkts Transmitted: 503
Pkts Received: 89711
Small Buffers: 23
Rx_Q Overflows: 10
Carrier Losses: 9
Total Collisions: 184
Excess Collisions: 5
Rx FCS/Align Errs: 0
Internal Rx Errors: 0
Internal Tx Errors: 0
```

The status of the port includes the following information:

- Bridging - which functions have been enabled for bridging (see the `bridge` command).
- Routing - which functions have been enabled for routing (see `iproute` and `ipxroute` commands in your NMS manual).
- Enabled/Disabled - enabled if it is operational or, disabled if you used the `disable` command to disable it. If the port is enabled but not operational, its status will be broken. (A port could be broken if it is so badly misconfigured as to be unusable. You might also see a status of broken if an FDDI or Token Ring port can't connect to a logical ring, or if an Ethernet port continually fails as it tries to transmit.)

- Spanning Tree - the port's Spanning Tree state, which could be any one of the following states:
  - Blocking - The port is not currently the designated port to a LAN and is therefore not forwarding any packets. (This means there is another route to that LAN and, since the Spanning Tree protocol does not allow simultaneous redundant paths, this port is blocked. If the other route to that LAN goes down, this port would then start forwarding packets.)
  - Listening - The port is listening for other bridges on the network to determine if it should go to the forwarding or blocking state.
  - Learning - The port is listening for other bridges on the network and making a table of addresses from packets that it has received. Once the port goes to the forwarding state, it can then use the address information it has learned.
  - Forwarding - The port is the designated port for the LAN and is forwarding packets and sending out bridge protocol packets.
  - Broken - The port is not forwarding packets. Reasons include no cable connected, no link status, or network management has disabled the port.
  - Disabled - The port is not configured for Spanning Tree.
- Pkts Transmitted - number of packets transmitted from the port. This includes any packets that might have experienced transmission errors. (The port's statistics are reset whenever the port is started.)
- Packets Received - number of good packets received through the port. Packets with reception errors are not included, nor are packets local to that segment that are hardware filtered.
- Small Buffers - number of buffers currently assigned to the port (see RX_Q Overflows below).
- RX_Q Overflows - number of incoming packets dropped by the port due to a lack of buffers. After a reboot, the ATX tries to automatically re-allocate the Small Buffers among the ports so that the total number of RX_Q Overflows is minimized.
- Carrier Losses - number of packet transmissions that detected a loss of carrier (usually a transceiver problem).

- Total Collisions - number of collisions during packet transmissions.
- Excess Collisions - number of packet transmissions that were aborted due to 16 collisions (usually a transceiver problem).
- RX FCS/Align Errs - number of times a received packet was discarded due to a bad checksum or Frame Alignment error.
- Internal RX Errs - number of times an inbound packet was dropped due to an internal error. (Whenever a packet is dropped due to TX_Q Overflows, Internal RX Errs may also be incremented.)
- Internal TX Errs - number of times a packet transmission was aborted due to an internal error.

All of the counter values are reset to zeros if the ATX is rebooted or if the module housing that port is halted and restarted.

CHAPTER 5
DIAGNOSTICS AND TROUBLESHOOTING

5.1 POWER-UP DIAGNOSTICS

Built-in diagnostic capabilities for the Ethernet Switch Modules include:

- Power-up diagnostics, which are run every time an Ethernet Switch Module is brought online.
- Front panel status LEDs.
- Local and remote loopback tests.
- Temperature sensors.

5.1.1 Power-up Tests

The power-up diagnostics assure that the ATX and all the installed modules are operational. During diagnostic mode, the status LEDs are used differently than during normal operation.

When the ATX is powered-up, it automatically senses the installed boards and reassigns port numbers starting with the PPE as port 1.

During a normal power-up test, the diagnostics test the entire ATX starting with the PPE and proceeding slot by slot from the top down. The normal power-up sequence is described in Chapter 2, **Connecting to the Network**.

5.1.2 Power-Up Results

After completion of the power-up diagnostic sequence, all status LEDs on the ATX front panel should be on (lit), indicating that the modules have passed the power-up tests. Refer to Tables 5-1 through 5-5. If an Ethernet Switch Module fails a critical test, it is automatically disabled.

Table 5-1 Meaning of 3E05-04 LED Indicators

LED	Meaning
RX	Ethernet port is receiving data (LED flashes)
TX	Ethernet port is transmitting data (LED flashes)
PROC	Processor is ready for operation
POWER	Module hardware is receiving power

Table 5-2 Meaning of 3E07-04 LED Indicators

LED	Meaning
RX	10BASE-2 port is receiving data (LED flashes)
TX	10BASE-2 port is transmitting data (LED flashes)
PROC	Processor is ready for operation
POWER	Module hardware is receiving power

Table 5-3 Meaning of 3E08-04 LED Indicators

LED	Meaning
COL	Receiver and transmitter active at the same time on 10BASE-FL port
LNK	10BASE-FL port is connected to another device by a cable; both cable and port are working correctly (LED is turned on)
RX	10BASE-FL port is receiving data (LED flashes)
TX	10BASE-FL port is transmitting data (LED flashes)
PROC	Processor is ready for operation
POWER	Module hardware is receiving power

Table 5-4 Meaning of 3E02-04 LED Indicators

LED	Meaning
COL	Receiver and transmitter active at the same time on 10BASE-T port and when port enters jabber state (LED flashes)
LNK	10BASE-T port is connected to another device by a cable; both cable and port are working correctly (LED is turned on)
RX	10BASE-T port is receiving data (LED flashes)
TX	10BASE-T port is transmitting data (LED flashes)
PROC	Processor is ready for operation
POWER	Module hardware is receiving power

Table 5-5 Meaning of 3E02-08-ATX LED Indicators

LED	Meaning
COL	Receiver and transmitter active at the same time on 10BASE-T port
ACT	10BASE-T port is receiving and transmitting data
LINK	10BASE-T port is connected to another device by a cable; both cable and port are working correctly (LED is turned on)
PROC	Processor is ready for operation
POWER	Module hardware is receiving power

5.2 OPERATIONAL DIAGNOSTICS

Built-in local and remote loopback tests can be used to test individual ports while the ATX is operational. When in local loopback, a port is disconnected from its network. The ATX generates loopback packets for the port, and the port loops the packets back without sending them onto its network.

During a remote loopback test, the port is in normal operation, sending and receiving packets to its network. The ATX generates loopback packets which are sent out of the port to a particular destination device on the port's network. The destination device echoes the packet back onto the network, and the originating port receives the packet.

For both types of tests, normal operation is indicated when generated packets are received back (after looping) without errors. For remote loopback tests, the ATX creates LLC Type 1 test packets for LANs and PPP echo-request packets for WANs and UARTs.

Both types of loopback tests can be initiated by the NMS, and test results are reported to the NMS.

5.2.1 Diagnostic Results

ATX diagnostic results are indicated in two ways: by observing the front panel LEDs (which are explained later in this chapter) or by reading NMS trap messages. Both power-up and loopback diagnostics produce traps, which are sent to the NMS and may be logged for future reference. In some cases it may be more convenient to simply observe the LEDs, but in most cases traps provide more information. There are no LEDs for the loopback tests—the results of these tests must be observed (i.e., accurate packet transmission) or read using an NMS (i.e., examine traps).

5.3 TROUBLESHOOTING

5.3.1 If The Module Fails To Power Up

If the Ethernet Switch Module fails to power up when the ATX is on and functioning properly:

1. Check the status of ports using LCM.
2. Reset the Ethernet Switch Module and observe the power-up sequence again.
3. If the sequence is still abnormal:
    a. Take the module offline by pressing the OFFLINE button on the module's front panel.

b. Remove the interface module by unscrewing the two retaining screws on the module's front panel. Pull the module out using the "ears" on the front panel.

c. Carefully but firmly press down on all socketed components.

d. Re-install the module. Make sure the module is properly seated and tighten the retaining screws.

e. Reset the ATX and observe the power-up sequence.

4. If it is still abnormal, contact Cabletron Systems Technical Support.

5.3.2 Connectivity Problems

If the Ethernet Switch Module powers up normally but the workstations are unable to communicate:

1. Check the LEDs for abnormalities which may help indicate the source of the problem. (LED behavior during normal operation is explained earlier in this chapter.)

2. Check the status of the ports using LCM.

3. Check for loose connections between the module, transceivers, and devices.

4. Check that the proper type of cable is used: crossover or straight-through depending on the configuration; distance limitations are adhered to; the 5-4-3 rule is not violated, etc. (Refer to Appendix B for cabling information and the 5-4-3 rule.)

CHAPTER 6

ADDING/SWAPPING MODULES

Once you have received your ATX, you may want to add a new module to expand your network bandwidth, replace a module with a module of a different type, or swap a module with another module of the same type. If you are:

- Adding an Ethernet switch module to a previously vacant slot or to a slot that had a different type of module, refer to the section **Adding an Ethernet Switch Module** below, for instructions.
- Replacing a module, refer to Section 6.3, **Swapping an Ethernet Switch Module**, on page 6-2 for instructions.

Before adding or swapping modules, refer to the latest version of the ATX Release Notes (provided with your ATX software) for information about software and hardware version numbers and compatibility.

6.1 UNPACKING THE ETHERNET SWITCH MODULE

Unpack the Ethernet switch module carefully, handling it by the edges only, and inspect it for possible damage. If any damage is evident, contact Cabletron Systems. Save the original container and antistatic wrap in case the module needs to be repaired.

6.2 ADDING AN ETHERNET SWITCH MODULE

If the module you are adding is of a different type than the module that previously occupied that slot, or if the slot was previously vacant, you have to reboot the ATX so it will recognize the new module.

1. Make sure the ATX is powered off.
2. Remove the network connections from the module you are going to replace.
3. Loosen the screws at each end of the front panel of the interface module you are going to replace.

4. Remove the installed interface module by pulling gently but firmly on the ears at the ends of the module's front panel.
5. Gently slide the Ethernet switch module into the plastic guides in the module slot until it is completely inserted. Push the module firmly into place, as far as it will go, to fully engage the connectors at the back of the module with the backplane at the rear of the ATX chassis.
6. Tighten the screws on each side of the module's front panel.
7. Power on the ATX, and check the Ethernet switch module LED power-on sequence as described in Chapter 2**, Connecting to the Network**.
8. Make the connections to the network as described in Chapter 2.

6.3 SWAPPING AN ETHERNET SWITCH MODULE

When swapping identical modules, it is recommended that you remove power to the ATX. However, the Ethernet switch module you are replacing must be taken offline first, as described below.

1. Take the module to be replaced offline, either by pressing the OFFLINE button on the front panel, or by using the LCM `offline` command.
2. Remove power from the ATX.
3. Remove the network connections from the module. Note the ports to which the network connections attach.
4. Loosen the screws at each end of the front panel of the module to be replaced.
5. Remove the installed module by pulling gently but firmly on the ears at the ends of the module's front panel.
6. Gently slide the new module into the plastic guides in the module slot until it is completely inserted. Push the module firmly into place, as far as it will go, to fully engage the connectors at the back of the module with the backplane at the rear of the ATX chassis.

7. Tighten the screws on each side of the module's front panel.
8. If you took the original module offline by pressing the OFFLINE button, the new Ethernet Switch Module will automatically come back on line when it is inserted in the slot.

   If you used the LCM `offline` command to take the original module offline, you must use the `online` command to bring the new module online.
9. Check the module LED power-on sequence as described in Chapter 2, **Connecting to the Network**.
10. Make the connections to the network as described in Chapter 2.

APPENDIX A
TECHNICAL SPECIFICATIONS

Standards Compliance

- Twisted pair Ethernet
- Thin Coax Ethernet
- Fiber Optic Ethernet
- Ethernet Version 2
- IEEE 802.3, 10BASE-T, 10BASE2, 10BASE-FL

Protocol Translations

- TCP/IP
- IPX
- AppleTalk

Dimensions

Length	30.99 cm (12.2 in.)
Width	24.13 cm (9.5 in.)
Weight	1.02 kg (2.25 lb.)

Environmental Requirements

Operating temperature	5˚ C to 40˚ C (41˚ F to 104˚ F)
Storage temperature	-30˚ C to 90˚ C (-22˚ F to 194˚ F)
Relative humidity	0% to 95%, non-condensing

Connectors

3E02-04	RJ45 for UTP
3E07-04	BNC for Thin Coaxial Cable
3E08-04	ST for Fiber Optics
3E05-04	DB15 for AUI
3E02-08-ATX	RJ45 for UTP

LEDs

- Power
- Processor (Processor status/ready)
- Link
- Collision (3E02-04 and 3E08-04 only)
- Receive
- Transmit

Bridging Domains

- Transparent
- Source Routing
- Source Routing Transparent

Certifications

Safety	UL 1950, CSA C22.2 950, EN60950 and IEC 950
Emission	FCC Part 15 Class A, EN55022 Class A, and VCCI Class I
Immunity	EN50082-1

APPENDIX B
CABLES

B.1 TYPES/CONNECTORS

Table B-1 Cable Types and Connectors

Cable	Type	Male Connector
Unshielded Twisted Pair	100 Ohm UTP, 22 - 26 AWG 0.4 - 0.6 mm, 2 pairs	8-pin RJ45
AUI	External Transceiver Drop	15-pin DB15, AUI
Thick Coaxial Cable	50 Ohm Coax	N-Type
Thin Coaxial Cable	RG58 A/U or RG58 C/U 50 Ohm Coax	BNC
Multimode Fiber Optics	50/125, 62.5/125, 80/125 or 100/140 Micron Core/Cladding	ST

B.2 CABLE SPECIFICATIONS

Table B-2 UTP Cable Specifications

Type	100 Ohm (e.g., IBM Type 3 or AT&T DIW)
Number of Pairs	2 or 4
Max. Link Segment Length	328 ft (100 m)
Min. Link Segment Length	2.0 ft (0.6 m)
Max. Number of Attachments	2

Table B-3 AUI Cable Specifications

Type	External Transceiver Drop
Max. Drop Cable Length	165 ft (50 m)
Min. Drop Cable Length	None
Max. Number of Attachments	2

Table B-4 Thick Coax Cable Specifications

Type	50 Ohm Coax
Max. Cable Segment Length	1640 ft (500 m)
Min. Cable Segment Length	8.2 ft (2.5 m)
Max. Number of Attachments	100

Table B-5 Thin Coax Cable Specifications

Type	RG58 A/U or RG58 C/U Coax
Max. Cable Segment Length	606 ft (185 m)
Min. Cable Segment Length	1.5 ft (0.5 m)
Max. Number of Attachments	30

Table B-6 Duplex Fiber Cable Specifications

Type	50/125, 62.5/125, 80/125, 100/140 micron core
Max. Link Segment Length	1.24 mi (2.0 Km)
Min. Link Segment Length	None
Max. Number of Attachments	2

B.3 10BASE-T PIN ASSIGNMENTS

An Ethernet cable link requires the use of two pairs of a multi-pair cable. While a cable containing only two pairs of wire can be used, it is more common to use four-pair cabling for 10BASE-T links. The jacket of each wire in a four-pair cable will have an overall color; brown, blue, orange, green, or white. In a 4-pair UTP cable (the typical UTP used in networking installations) there will be one wire each of brown, blue, green, and orange, and four wires whose overall color is white. The white wires will be distinguished from one another by periodically placed (usually within 1/2 inch of one another) rings of the other four colors.

Each wire pair must be attached to the RJ45 connectors in a certain orientation. (See Table B-7 for an explanation.)

Refer to the diagram below and note how the pins are numbered. Be sure to hold the connectors in the same orientation when connecting the wires to the pins.

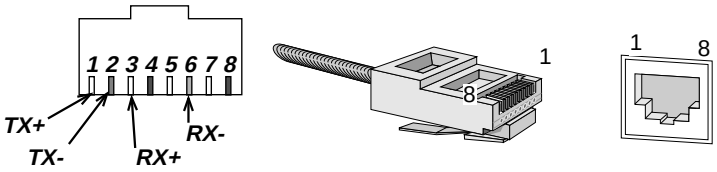


Figure B-1 RJ45 Connector Pin Numbers

Each UTP link segment must have an RJ45 male connector attached to both ends. According to the 10BASE-T specification, pins 1 and 2 on the RJ45 connector are used for transmitting data; pins 3 and 6 are used for receiving data, as shown below.

Table B-7 RJ45 Crossover Pin Assignments

RJ45 Pin	Assignment*
1	Tx+
2	Tx–
3	Rx+
6	Rx–

*The "+" and "–" signs are used to represent the polarity of the two wires that make up each wire pair.

B.3.1 Crossover Wiring

Two Ethernet 10BASE-T devices can communicate only if the transmitter on one device is connected to the receiver on the other device. This reversal, or crossover function, can be implemented either in the wiring or in the device itself.

When connecting two identical UTP ports (i.e., both crossover ports or both straight-through ports), a crossover must be implemented in the wiring. Refer to the following table for crossover pin assignments.

Table B-8 Crossover - RJ45 Pin Assignments

Hub	Device
1 (Tx+)	3 (Rx+)
2 (Tx–)	6 (Rx–)
3 (Rx+)	1 (Tx+)
6 (Rx–)	2 (Tx–)

B.3.2 Straight-Through Wiring

If the UTP link segment is to join two ports and only one of the ports has an internal crossover, the two pairs of wires must be straight-through, as shown below.

Table B-9 Straight-Through RJ45 Pin Assignments

Hub	Device
1 (Tx+)	3 (Tx+)
2 (Tx–)	6 (Tx–)
3 (Rx+)	1 (Rx+)
6 (Rx–)	2 (Rx–)

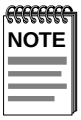
B.4 AUI PIN ASSIGNMENTS

Table B-10 AUI Pin Assignments

Pin	Circuit	Signal Name
3	DO-A	Data Out Circuit A
10	DO-B	Data Out Circuit B
11	DO-S	Data Out Circuit Shield
5	DI-A	Data In Circuit A
12	DI-B	Data In Circuit B
4	DI-S	Data In Circuit Shield
8	CO-S	Control Out Circuit Shield
2	CI-A	Control In Circuit A
9	CI-B	Control In Circuit B
1	CI-S	Control In Circuit Shield
6	VC	Voltage Common
13	VP	Voltage Plus

Table B-10 AUI Pin Assignments (Continued)

Pin	Circuit	Signal Name
14	VS	Voltage Shield
Shell	PG	Protective Ground (Conductive Shell)



Voltage Plus (VP) and Voltage Common (VC) use a single twisted-pair in the AUI cable.

B.5 5 - 4 - 3 RULE

Between any two nodes (i.e., PCs or other stations) on the network, there may be:

- Up to 5 segments in series
- Up to 4 repeaters or multi-port hubs
- Up to 3 populated segments (that is, segments attached to two or more PCs).*

* The remaining two segments are unpopulated; these are known as inter-repeater links or IRLs. This distinction between populated and unpopulated segments is significant for coax networks only.

This rule completely consistent with the IEEE 802.3 specification, and is meant only to summarize the configuration specification.

B.5.1 Definitions

Backbone
A coax segment with hubs, possibly file servers.

Cascade
A method of interconnecting hubs using their ports rather than their stacking connectors.

Link Segment
A length of twisted-pair or fiber cable joining a pair of devices in a star topology (e.g., two hubs or a hub and a station).

Populated Segment
A coax segment to which multiple devices are attached: maximum 100 transceivers for thick coax and 30 devices (e.g., stations and hubs) for thin coax.

Coax Segment
An electrically continuous length of coax cable with a terminating resistor at each end.

Stack
A method of interconnecting multiple hubs so that multiple hubs appear as one large hub or repeater to the network.

Unpopulated Segment or Inter-Repeater Link (IRL)
Relevant to coax networks only.
A coax segment with one repeater or hub at each end and no other attached devices is an IRL.

INDEX

A
Adding modules 6-1

B
Bridging
domains A-2

C
Cabling. See wiring
Certifications A-3
Configuration tools 3-1
Connectors A-2

D
Definitions B-7
Diagnostics
LED 5-1
power up 5-1
results 5-4
Dimensions A-1
Displaying port status 4-1
Document conventions 1-2

E
Environmental requirements A-2

F
Filtering 3-2
Front panel
3E02-04 1-6
3E02-08-ATX 1-10
3E05-04 1-9
3E07-04 1-7
3E08-04 1-8
ATX 1-5

H
Help 1-3

L
LEDs
diagnostic 5-1
power up sequence 2-1
types 1-6 to 1-10

M
Module versions 1-4

P
Pin assignments
AUI B-5
RJ45 crossover B-4
Protocol translations A-1

R
Repeater rule B-6

S
Specifications A-1
Standards compliance 1-5 to 1-9
swapping a module 6-2

T
Technical support 1-3
Troubleshooting 5-4

U
Unpacking 6-1
UTP
wire color B-3

W
Wiring
connectors B-1
crossover wiring B-4
specifications B-1
straight-through B-5
types B-1